DOCUMENT RESUME

ED 145 914 JC 770 533

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TITLE A Math Lab Study.
INSTITUTION Mira Costa Coll., Oceanside, Calif.
PUB DATE Jun 77
NOTE 53p.; Extensive materials appended to the study have been deleted due to poor reproducibility

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS Audiovisual Aids; *Autoinstructional Laboratories; College Mathematics; Community Colleges; Coordinators; Instructional Materials Centers; *Junior Colleges; *Learning Laboratories; *Mathematics Instruction; Mathematics Materials; *Program Descriptions; Surveys; Tutorial Programs

ABSTRACT

In order to make recommendations for improvement of the mathematics laboratory at Mira Costa College, questionnaires were mailed to 100 community colleges. Of the 40 responding, 17% had completely self-paced labs, 20% combined open labs with individualized instruction, 20% had no lab instruction, and the remainder had a variety of offerings. Courses ranged from one offering to eight, with arithmetic, elementary algebra, and intermediate algebra predominating. Funds were provided either by the district (n=13), special grant funds (n=13), or the student body (1). Of 15 colleges using audio-visual materials, a majority preferred texts supported by audio tapes. Students were encouraged to persevere in lab use by personal contacts, phone calls, or postcards. Facilities were variously housed in regular classrooms (13), separate centers (12), the library (6), or in separate tutoring or testing rooms. An instructor served as director in 15 colleges, with classified staff, instructional associates, or librarians serving as director in 11 institutions. Labs were open from four to 80 hours weekly. In addition to the questionnaire results, on-site visitations are reported for 11 campuses, and the combined information sources are utilized to recommend to Mira Costa College an increase in lab personnel, particularly classified aides, and increase lab space and/or open hours. (RT)

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A MATH LAB STUDY

F.D. Kelly
M. Rajah

Mira Costa College
Oceanside, California
June, 1977

JC 770 533

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THE ENCLOSURES APPENDED TO THE ORIGINAL DOCUMENT HAVE BEEN DELETED DUE TO POOR REPRODUCIBILITY.

INTRODUCTION

Beginning in September 1976, a math lab was started at MiraCosta College with a mathematics instructor as director. The type of lab is primarily a "lecture lab" combination, but it is also an "open lab" for many students who need help in mathematics courses other than the scheduled ones. Also, a few students use the lab as a self-paced individualized one.

Previously, attempts have been made to give individualized help. At first, a room with a large amount of blackboard was used as a lab. A student/tutor and/or teacher met two days a week with students seeking help. To facilitate large numbers of persons, the students were encouraged to work at the blackboards, while the tutor and/or teacher walked around giving individual (or small group) encouragement and aid. At times, this attempt was very successful depending on tutor and student time.

Later, an audio-tutorial method was adopted. Texts were selected with corresponding tapes for the arithmetic, beginning and intermediate algebra courses. Students met in regular classrooms for question and/or reviews for 2 or 3 days a week and were required to listen to tapes for the "lecture". This method also proved to have some advantages over the lecture method only. However, after a period of 6 or 7 years the survival rate varied from about 40% to 60% and the graphs of student grades were more U-shaped curves than "normal" bell shaped ones.

In the spring of 1976, an attempt was made to make the arithmetic and algebra courses more "self-paced" ones. Students meet in classrooms for quizes, tests and individual help from a teacher and a tutor. Also, a library room was set aside as a lab where students could secure teacher or tutor help as well as listen to tapes. This method proved very successful for a few students but many students were lost. However, the method had its merit and was somewhat successful with the more mature students, especially in the night classes.

The following study is being made upon the suggestion of Dr. Meisen, Vice-President, Instruction, as a means of seeking information about other college math labs which will aid in improving the present one at MiraCosta College. Also, great interest was aroused at a math conference which was part of the Annual Meeting of the American Mathematical Association of Two Year Colleges. The conference was "a seminar/workshop on the implementation and administration of math labs and alternative modes of instruction in developmental mathematics".

Teachers from all parts of the United States attended the seminar representing colleges which have various types of labs as well as representing colleges with no labs. A special report was made by the director of a lab at Tacoma Community College. He indicated some of the history, evolution, physical and human environment needed to have a "successful lab". During one of the sessions, each teacher gave a very short description of the labs at their college. A few teachers reported that no lab was available at their institutions, but noted that the traditional lecture method was having an increasing number of failures and/or "drop-outs". (See included report on T.C.C.'s lab as well as notes from seminar).

Realizing that many colleges have established various kinds of labs and that a great deal of experimenting was in the process, a questionaire was sent from MiraCosta College to over 100 colleges as an attempt to find information about the various tends that have been and are being taken to improve math instruction by use of math labs. Also, many colleges were visited in order to seek more information.

A general resume of responses to questionaires is included in this report, showing the various types of existing labs, personnel, ways of funding, physical aspects, attitude of the math faculty and administration, advantages and disadvantages, plus any plans for change.

Reports on special visitations are included with printed enclosures that

were available. Some of the enclosures include comparison studies in regard to cost as well as relative success as compared to traditional-lecture method. A sample questionaire is included containing information about the lab at MiraCosta College. Other printed material on labs have been (and are being) received and are enclosed in separate ringed notebooks for futher perusal and study.

Since questionaires are still being received, as well as printed material, the study will probably be a continuing one. However, at this time I hope to be able to draw some conclusions which can be used to improve the lab at MiraCosta College.

I wish to express appreciation to the following: Dr. Meisen for suggesting such a study, to the Math Faculty and Longevity Committee for their help and encouragement: to Mr. Rajah who accompanied me on several of the visitations as well as aiding me in assembling this report; and to Patricia R. Mallion of Addison-Weseley Publishing Company for her suggestions and aid.

Floyd D. Kelly
March, 1977
MiraCosta College

Supplementary Notes: Seminar on Math Labs
by R. C. Spangler, Tacoma Community College

General Types of Math Labs in Use Across the Country:

1. "Drop in" math lab to help students in doing homework from lecture classes.

2. Structured: use as in conjunction with lecture 3 times a week with problem sessions in a lab using individualized instruction books!

3. Individual study tutorial lab: Totally individualized and for independent study
   a. Tutors: assigned hours
   b. "Drop-in" type
   c. Instructors usually available (all but one instructor at Tacoma Community College spends some time in the lab)

Objectives: T.C.C. Math Lab

1. Serve all math needs: Jr. high, high school, college, retired persons, housewives, persons with varied work schedule, non-readers.

2. Improve teacher effectiveness: reduce drop out rate. (lab type of teaching permits changing to easier course.)

3. Increase cost effectiveness.

4. Keep administrative system and equipment low. (There are 4 times as many students in the math lab as there are in the classroom instruction).

Tacoma Community College Lab:

Organized in 1971, over 1,000 students, 27 courses.

1. Open Monday-Friday 8:30 am to 2:30 pm and 5:30 pm to 9:00 pm
   Saturday 8:30 am to 1:00 pm (many students come)

2. Three instructional systems:
   a. Individual study: 1300 students at TCC per quarter
   b. Basic skills lab (4th grade reading and below)
   c. Student tutorial: students sign up for individual help

3. Attendance:
   a. Sign-in honor system
   b. Students are encouraged by phone calls and letters after several absences
   c. Students must attend and complete a designated number of units in order to receive an incomplete (may continue work the following semester without registration)
   d. A card file is kept showing attendance and completed work

4. Lab personnel:
   a. Full time instructor in charge
   b. Other instructors also come in to help
   c. About 1 instructor to 20 students with tutor help
   d.

Time	# of instructors
8:30 - 9:30	1
9:30 - 10:30	2
10:30 - 12:30	3
12:30 - 1:30	2
1:30 - 2:30	1

e. Personal approach used by instructor and tutors: they "man the aisle", helping and encouraging students.

Testing Area:

1. Separate room (from math lab)

2. Lab technician administers and corrects tests

3. No time limit for tests: students must get 80% before proceeding with new work

4. There are 4 test forms for those testing below 80% (tests are used diagnostically to aid in locating errors)

5. If student cannot bring grade up to 80%, he is exposed to other resources, tapes, drill, material below level of text, special tutors

6. Students with low reading ability are identified and encouraged to attend reading lab. (TCC approximately 20 students below 4th grade reading ability per quarter)

Basic Essentials for Successful Lab:

1. Director: a member of math department

2. Co-operative staff and administration

3. Easily understood text containing drill and several tests for each unit of work (3/4)

4. Active involvement by teachers and tutors with students and their work

5. Security for exams, separate areas for studying and testing

6. Good dispensing and correcting procedures

7. Supplementary material and "special" tutors for those students having difficulties

8. "Prodding system", keep card file on each student, use phone and mail to encourage attendance and continued effort. (mail bill $900/year, which comes from instructional fund)

Recommendations:

1. Math instructor in lab at all times (if possible) with desk located in study area, to administer tutor and technical work, as well as work with students personally.

2. Full time lab technician to perform duties related to keeping files on materials and students, dispensing of needed materials, and recording

3. In regard to teacher load, lecture and lab hours should be equal

4. About one instructor should be available for 20 students, plus 3 tutors

5. Students must show work on exams (teacher only can give partial credit)

6. Attendance (lab): (10% "no shows" on 1st day)
   a. Encouraged for those able to maintain pace to finish at end of designated time

   b. De-emphasized for those progressing at more rapid rate

   c. 3 hours a week required for those behind in work in order to get an "incomplete grade" and hence be able to continue work the following semester. (about 30% receive incompletes)

7. Keep card file:
   a. Letters and phone calls do tend to encourage students in math work as well as attending classes and lab

   b. Reasons for not completing course are recorded, job, moved, change of major, students obtained math goal with completion of course.

RESUME OF QUESTIONAIRE

The number of questionaires sent out was over 100 and a return of over 40% resulted. However, many of the returned questionaires were completed with enthusiasm. Some were even completed during Christmas vacation. They were mailed during the week previous to the vacation. Over two thirds of the colleges do have a math lab. Since answers are still being received, any attempt at exactness seems to be inappropriate at this time.

General analysis as to types that exist indicate that labs vary from 70% that are only drop-in labs with various combinations of offerings. Another 20% showed a combination of open labs with some sort of individualized instruction, paced, self-paced, independent study or tutorial. Around 17% are completely self-paced.

After one ambiguous question pertaining to type "listed as others", eight colleges responded with the following descriptions: Posted progress charts (2) regular attendance (2), counselor contact (1), computer praise, I.B.M. class, make-up tests. What questions were omitted?

About 20% indicated that they had no lab offering. Enrollment per semester seemed to vary according to size of the college: about 10 colleges indicated between 1000 to 5000 enrollment - 25% 300 or less enrollment, about 18%: lab 300 and 500 enrollment about 12%.

The number of course offerings vary from one course only to as high as eight. A tally indicates courses offered as follows: (As to number of colleges)

a. combination of arithmetic, elementary algebra, intermediate algebra - 10
b. no one with additional courses: trignometry - 5, geometry - 3, pre-algebra, college algebra, principals of math, slide rule - 1, statistics - 1
c. one course only: arithmetic - 3, introduction to computer programming - 1, intermediate algebra - 1

A tally of courses to be added are:

a. elementary algebra - 3

b. intermediate algebra - 4

c. trignometry - 4

d. college algebra (pre-calculus) - 3

e. computer course - 2

f. plane geometry - 2

g. math for fire science - 1

h. metrics - 1

i. arithmetic - 1

A tally of the response to the question in regards to funding resulted in the following data, (assuming that "blank or no" indicated that funds come from district and/or math department. (1) District - 13, (2) Special funding - 13, (3) Student body - 1.

Various sources for special funding: (primarily for tutors) (1) Innovation grants - 2, (2) R.O.P.S. - 2, (3) N.D.E.A. - 1, (4) Title 4 - 1, (5) H.E.W. - 2, (6) F.E.A. - 1, (7) N.S.F. - 1, (8) C.W.S. - 1, (9) E.S.U.E. - 1, (10) Work Study - 2.

Audio-Visual Material: Yes - 15 colleges

A. Preferences: (As to number of colleges)
   1. Audio tapes
      a. Text dependent on audio tapes - 2
      b. Text independent of, but supported by audio tapes - 18
   2. Audio visual - 3 (?)
   3. Slides - 3
   4. Filmstrips -

B. Course with corresponding text
   1. Basic Arithmetic
      a. Noon, et al - 7
      b. Keedy & Bittinger - 1
      c. Carmen & Carmen - 3
      d. Blanchard (Chaffer) - 1 (2)
   2. Beginning Algebra
      a. Noon, et al - 6
      b. Keedy & Bittinger - 6
      c. Carmen & Carmen - 3
      d. Blanchard - 2

3. Intermediate Algebra

   a. Newmeyer, et al - 5

   b. Keedy & Bittinger - 4

4. Trignometry

   a. Klentos - 4

The Following Tallies Indicate Corresponding Number of Colleges:

Use of Material:	Extensively	Moderately	Very little	Not at all
a. Audio-tapes	6	5	10	4
b. Video tapes	1	4	5	9
c. Filmstrips			6	11
d. Slides	1		5	13
e. Slide/tape	2	3	4	8
f. Transparencies	1	1	2	12
g. Other		1	1	

Policies on tapes: Check out tapes: Yes - 9

   a. Publisher permission - 9

   b. Local permission - 1

   c. Students may copy - 9

Description of Text

   a. Standard lecture text - 11

   b. Semi-programmed text - 12

   c. Considering change - 9

Method of encouraging perseverance

   a. Information card file - 4

   b. Letter (card) - 5

   c. Phone - 12

   d. Personal contact - 17

d. Personal contact (cont'd)

1. posted progress charts
2. counselor contact
3. regular attendance
4. praise
5. I.B.M. card

Printed Material describing lab: - 18 colleges

a. Catalog - 5
b. General description - 10
c. Student information pamphlet - 12
d. Attendance policy - 9
e. Comparative studies - 3
f. Will forward - 6

Physical conditions of lab:

a. Regular classroom - 13
b. Separate center - 12
c. Part of library facilities - 6
d. Separate testing center - 2
e. Separate rooms for special tutoring - 10
f. Other - 1 (faculty offices)

Full time director: Yes - 10: No - 18

a. Instructor (full and part time) - 15
b. Classified - 7
c. Instructorial Associate - 3
d. Librarian - 1

As director of the lab, I must admit that some difficulties have arisen: especially, in regard to routine help! Fortunately, a very efficient person was found by the placement office to take care of routine tasks of filling, ordering materials, duplication, typing, helping to seek tutors and arrange tutor hours, and the maintaing of security. This person was paid from "Work Study" funds but recently sought other employment. Thanks to the help of the work study placement offices, a promising replacement has been found. Hopefully a full time classified helper will be available next semester.

The lab seems to be a successful one due to the co-operation of the math faculty, the administration, the library staff, the F.D.C. office and the employment services on campus.

Future plans should include increased lab services for evening students, a lab during the summer session, and the establishment of a testing area.

Hours for lab:

a. Day only - 11

b. Day and night - 26

c. Saturday - 7

d. Sunday - 1

e. Number of hours

1. over 60 hours - 12
2. 50 to 60 hours - 5
3. 40 to 50 hours - 5
4. 30 to 40 hours -5
5. 20 to 30 hours - 4
6. 10 to 30 hours - 4
7. below 20 hours - 4

Two colleges are open about 80 hours a week: Foothill and DeAnza.

SUMMARY AND RECOMMENDATIONS FOR LAB FOR MIRACOSTA COLLEGE

Apparently, the main objectives of the math labs is to improve the method of instruction of mathematics in order that a greater number of people can use and appreciate the role of math in their daily lives. After noting the variety of types of math labs, the personnel needed, the amount of equipment necessary as well as the corresponding cost, one finds themselves at a loss as to where to begin and what to recommend for improvement for this particular lab at MiraCosta College. However, an attempt will be made in light of the experience and ideas gained from the conference on labs, the visitations and summaries of existing labs, the analysis of responses on the questionaire, and noting the difficulities involved in the directing of a newly formed lab at M.C.C.

The needs for lab improvement and growth seem to fall into two main categories and are as follows:

Personnel: (1) teachers and director (2) classified aid (3) tutors

Equipment: space for study, equipment storage, reference library, tapes, visual aids, furniture, cubicles, etc.

PERSONNEL:

Teachers and Directors: Since part of the lab function is a supportive one to the lecture, teacher input and participation is highly important! Teachers should be encouraged to spend regular hours in the lab either as volunteered office hours or as part of their teacher load (see report on Visitation to Bakersfield). In order to accomplish this, a close liaison must be maintained between the lab and the math faculty. At present, this is a difficult task since the math teacher's offices are scattered and communication is therefore quite difficult. Therefore, I recommend that the offices for members of the math faculty, especially those connected directly with the lab be placed closer together in order to facilitate input and promote better communication. In the future, perhaps the lab and math offices could be located closer together or in the same building. (See visitation reports on Long Beach, Santa Barbara and Golden West).

Reports from some other labs indicate that a teacher director and/or teacher (s) be available to help students, especially during the crowded lab hours. By teacher participation, the lab should be better able to meet individual student needs more effectively, and enable the lab to be available more hours during the day, (a need at M.C.C.) During lab hours, a teacher will be exposed to a variety of student questions and needs which he might not meet in the lecture hour, thereby helping one to be a more effective teacher.

Several colleges with teacher directed labs equate one lab hour to one lecture hour in the teaching load. (see questionaire resume page __ and enclosure on Tacoma Community College lab page __). After 6 months as director of the lab at M.C.C., one can attest to the fact that working with many students with different backgrounds and varied needs in math can be a very rewarding but also a very exhaustive experience.

Although the director should have an active part in the lab, dealing directly with individual students, there should probably be a separate office where one can do special counseling, perform needed "follow up" work, contacting those students, who for various reasons are not achieving in math or who have quit class, encouraging them to persevere by seeking special tutor help, or by enrolling in another course, and/or enrolling in the lab as a "self-pacing" student. In addition, the director should keep aware as to what is happeing in other labs in order to increase the effectiveness of the lab at M.C.C., to select, review and evaluate materials.

Classified aid (s). The greatest need at this time seems to be that of classified help in order to take care of all the routine tasks of maintaining files, keeping records, ordering, typing, recording, scheduling tutors, equipment and room security, issuing and refiling of answer sheets, etc. (an endless list) and to aid in developing and keeping a good liaison between the lab and the scattered members of the math teaching faculty and tutors. (see job description on page __). At present, this need has been filled to some degree of efficiency

by part-time, work study, student-help. However, in order to maintain a math lab, there must be a regular, trained, full-time classified aid. Request has been made for a full time classified aid, but hopefully one will be available at least 25 hours a week next semester.

Tutors: Tutors at M.C.C. are, at present, students who have completed and have shown some proficiency in math (at least in arithmetic and algebra courses). Most tutors are students from M.C.C. but some have come from surrounding institutions i.e., Palomar, University of California at San Diego, and San Diego State University. These people are hired on a part time basis to work in the lab during the busy hours: 9 a.m. to 2 p.m., plus 2 hours in evenings on Monday through Thursday. They are also available for students by appointment through the E.P.C. Center at MC.C. (see enclosure on page __ entitled "Tutor and Peer Advising").

Although tutors are endorsed by appropriate M.C.C. faculty, a need does exist for selection, training and orientation of tutors to the math lab and to the students needing help in math. Perhaps some of them should enroll in Psychology 53A-53B, Introduction to Peer Advising, course required for the peer advisors. The name could be changed to "Introduction to Peer Advising and Tutoring".

A means of selecting tutors could be made by teachers of the math courses who have occasional "black board days" when students are asked to go to the board to work math problems and the better students (potential tutors) are encouraged to help them. Tutors selected from a particular course are familiar with teachers and text approach and thereby may be a better tutor. Retired math teachers are another source for tutoring service, either on a volunteer or part time basis. (see enclosure on Bakersfield, University of Arizona and University of California at San Diego).

An orientation sheet should be formulated, pointing out the requirements of, and personal gains of tutoring services. Many students are good in math but lack certain qualities to make successful tutors. In the lab at M.C.C. tutors are encouraged to "man-the-rows", using a personal touch to seek out students needing

help and encouragement. Those needing special help are referred to the E.P.C. room where special tutoring is available by appointment.

Another orientation sheet should be made available to those students seeking help in the lab. This sheet should include information on how the lab is run, how and where to check out resource equipment (tapes, reference books, etc.). Also, students should know that the lab approach is an evolving and experimental process! The student orientation sheet could point out that students helping students is encouraged (within limits). Many students need help in overcoming a feeling of shame brought about by previous failure(s) in mathematics. Students need to be encouraged to use facilities available, teachers, tutors, tapes, blackboards (for individual or group work) and reference library, as well as the availability of special tutoring by appointment.

Equipment: The amount and variety of equipment in math labs vary from a regular classromm to a large part of a research center with different types of furniture, and audio-visual aids with the accessories for producing materials. Comparing the effectiveness of the lab with the amount of equipment, one could conclude that there is little correlation. Of course, there is need for a further study in this regard. Since many colleges were able to secure funds for the equipping of labs, in all probability materials were purchased with little or no evaluation as to appropriateness to dtudents needs or cost effectiveness. (see enclosure from "Today's Education" , The Journal of National Education Association on page __)

Many students are self supporting and find it difficult to schedule classes around their outside work load, and perhaps many of them would seek math lab help if it were available. Several colleges have labs which are open 60 hours a week, (see questionaire resume on page ___, note the number having Saturday labs).

Except for a very few of the larger labs, the outstanding need is for space. At M.C.C student use of lab has increased greatly since Sept. 1976 and thereby

creating a need for more space. This increased use is due to the three-fold offerings: the "lecture-lab", combination with required attendance; the "open-lab" for the students from all math classes; as well as the "self-pacing" offering in which a student can enroll at any time and proceed at one's own rate. (about 8, Spring Semester of 1977).

At present, an apparent way to cover the space problem is to make the lab available more hours during the day. Perhaps, the lab should be open for all the library hours. Many students are self-supporting and find it difficult to schedule classes around their outside work-load, and perhaps many of them would seek math lab help if it were available. Several colleges have labs which are open 60 hours a week.

Additional comments: The extended day enrollment at M.C.C. is approximately the same as the day; hence the need for an instructor-tutor lab exists. Extended day teachers have difficulties covering, in 2 class meetings (however long), the same material covered in the day classes which meet over 2 times a week, especially in math. Students need varied times to absorb and to gain experience in math. This fact seemed to become more evident in the attempt to meet this need in a "self-pacing approach used in the spring semester, 1976. This approach was more successful in the evening classes than in the day classes. A lecture-lab combination course should improve math instruction since it does give the student greater opportunity for individual questions which arise while students are attempting to work math problems.

Perhaps, the need for a math lab during the summer sessions exists also. Many students enroll because of past failure in math or because they could not schedule math classes during the regular semesters. It seems that summer students do have the same difficulties with the understanding of math, difficulties that are enhanced by the shorter period of time for completion of courses. A three way offering, "lecture lab" combination, "open lab", and especially a "self-pacing" lab, should improve the summer math instruction program at M.C.C.

Although statistical studies of the survival rates for the last semester have not been made as yet, it seems advisable that a placement test be used with strong emphasis on enforcement. However, special lab-counseling should be available for students who have taken courses before and would like to try this next course.

At present, the labe is equipped with audio-tapes for the arithmetic and algebra courses. These tapes were used to some extent previous to the establishment of the present math lab. For many students, tapes are a great aid and their continued use should be encouraged. Of course, students prefer seeking help from an available teacher and/or tutor and avoid the use of the tapes. The director feels that there must be a way to increase tape use. Perhaps the math teachers could require tape use until after the first test, giving the students a chance to become familiar with the tapes and to note whether they are of help.

Since storage space is at a premium at this time and the initial cost for other aids, audio visual tapes, film strips, materials for their production, is relatively large compared to the present math lab offerings, it seems that the purchase of such materials is not advisable at this time. However, the lab approach can be improved by the addition of some of these materials and should be considered for future purchase and use.

MiraCosta College
One Barnard Dr., Oceanside, Calif. 92054, Tel.(714)757-2121

December 6, 1976

To:

Re: Math Lab Questionnaire

Dear

We are making a survey on College Math Labs. We would appreciate your filling out the following questionnaire. Since the MiraCosta College District has been enlarged, a prompt reply is important in order that improvements for our Math Lab may be requested. A self-addressed stamped envelope has been enclosed for your convenience.

If you are interested in receiving the results of this survey, we will be happy to forward the same to you.

Yours truly,

Floyd D. Kelly
Math Lab Director

FDK:lf

Enclosures

Math Lab Questionnaire

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Instructor in Math Lab Full time
Other Title
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Enrollment: Day 3200

Evening 3000

1) What type of Math Lab do you have? (Rank in order of use, 1-highest to 5-lowest, use 0 if it does not apply)

a) Drop-in help lab. 1

b) Lecture-lab combination. 1

Lab started in Sept. 1974

c) Individualized instruction.
a) Paced.

b) Self-paced. 3

d) Independent study-tutorial lab.

e) Other (Please describe below).

Counselor contact 2
Quiz and testing 2-4

2) Approximate enrollment per quarter/semester. 300 /

3) What days and hours is lab open, and what personnel are available? (Include evening, holiday, and weekend hours.)

Monday through Friday 8:00 AM to 2:00 PM
Monday and Wednesday 5:30 PM to 7:30 PM
Tuesday & Thursday 6:00 PM to 8:00 PM

4) a) Are courses of instruction offered through the Math Lab? _____ If so, list them below giving credits for each and texts(s) now in use (Author/Title).

Although the lab is primarily lecture lab combination of arithmetic beginning and intermediate algebra, students may enroll in any math course as a self-paced student. (about 20 students this semester have elected to do this. (Spring semester 1977)

4) b) Are you planning to include other courses? Yes If so, please list below.

Trignometry

5) List your lab personnel below and briefly describe their functions. (director, teacher(s), tutors, classified aides, etc.; also, the hours each spends in the lab)

Tutors: (11) onetime basis of helping students in lab with/without appointment
Director: overseer of the lab - instructor

Lab. Assistant: Assists director, in charge of security and paperwork for lab and classes

6) Have you had special funding? Yes If so, list funding agencies, grants, and amounts below. (rooms, equipment, tutors, classified personnel)

E.P.C. funds for tutoring.
Federal work study program for all other student workers
College budge ($3,000.00) for all tutoring services)

7) Is the audio-visual material available in your lab geared to a specific text? Yes If so, please describe (audio tapes, video tapes, filmstrips, etc.) and the text to which these materials relate (author/title).

Audio tapes: Basic Arithmetic - Moon, Knorad, Klentos, Newmyer
Intermediate Algebra - Keedy and Bittinger
Introductory Algebra - Keedy and Bittinger

8) What type of media do you prefer with text?

a) Audio-visual tapes. _____

b) Text dependent on audio tapes. _____

c) Text independent of, but supported by audio tapes. X

d) Visual support for text.
1) Transparencies _____

2) Filmstrips _____

3) Slides _____

9) To what extent is this material used by students?

1= extensively
2= moderately
3= very little
4= not at all

a) audio tapes #3

b) video tapes 4

c) filmstrips 4

d) slides 4

e) slide/tape presentation 4

f) transparencies 4

g) other : _____

10) Are students permitted to check-out tapes for home use? No If so, do you have permission from the publisher? _____

11) Are students permitted to make copies of the tapes? No

12) What are the advantages to your lab? (Please feel free to use back of paper).

A. Provides a schedule in which students can study and seek individual help.
B. Provides immediate and continued teacher and tutor help (see lab sechdule)
C. Co-operation of math faculty, administration and employment personnel.
D. By self-pacing some students may complete more than one course a semester or take longer time to complete a course.

13) What are the disadvantages to your lab? (Please feel free to use back of paper).

A. Lack of full time classified help.
B. Need for more space.
C. Need for a separate testing area.
D. Ventilation: (building built for air conditioning but no air conditioning was installed.
E. Need for more tutor funds other than Federal, State and College budget.
F. A follow-up system to encourage students to persevere needs improvement.
G. No calculator is available.
H. Need for better tutor preparation: orientation to lab and work with individuals.
I. Need for more efficient communication between director and math faculty. Math offices are located on separate and somewhat remote areas of the campus.
J. Conflicts of "scheduled" and open labs.

14) Describe the present text(s) as follows:

a) Standard lecture text. X

b) Semi-programmed worktext. ____

c) Programmed or self-study text. X

15) Is your present text satisfactory? Not basic arithmetic

a) If part or your dissatisafaction is a function of the text's format, what format would you prefer?

1) Standard lecture text. ____

2) Semi-programmed worktext. ____

3) Programmed or self-study text. X

b) If format is secondary to other considerations, please list them below.

16) Are you considering a change in text(s) at this time? Yes What texts are you considering? (Author/Title)

Change Basic Arithmetic by Moon to book by Carmen and Carmen

17) How do you encourage perseverance?

a) Information card file. X b) Letter ____

c) Phone X

d) Other ____

Please explain :

e) Personal contact X

18) Do you have printed material describing lab? Yes

a) Catalogue _____

b) General description x

c) Student information pamphlets _____

d) Attendance policy (time clock, procedures) x

e) Comparative studies _____

If possible will you forward such information plus charges? _____

19) Describe physical conditions of the lab:

a) Regular Classroom. _____

b) Separate center. _____

c) Part of Library facilities. x

d) Separate testing center. _____

e) Separate rooms for special tutoring. _____

f) Other:Please describe below.

20) Do you have a full-time director? No

21) What is the general attitude of Math Faculty and Administration towards the Math Lab?

22) Is the Math Lab hour given equal teaching load status to the lecture hour? Yes _____ No X

23) Please feel free to make other comments.

The lab at MiraCosta College started in September 1976 and is now into the second semester. One large section in Basic Arithmetic while 2 sections of Beginning and Intermediate Algebra have 2 regular scheduled hours in lab per week. One section of Trig has 2 hours per week scheduled in the lab by arrangement. Many students from college algebra, calculus and other courses seek help in the "open lab" as well as by tutor appointment.

24) Check here if you desire a copy of survey. _____

THANK YOU FOR YOUR COOPERATION !

Math Lab Survey Visitation: Long Beach City College

One of the largest Junior Colleges which has a Math Lab is L.B.C.C. The Lab is directed by a certified teacher and has been in operation over three years. It is a large classroom (about 30' x 40'), closely located to Math lecture rooms and offices.

An individualized, (oaced), method of instruction is the main function although "drop-in" help services are available.

Courses are offered in:

1. Arithmetic
2. Beginning Algebra
3. Intermediate Algebra

The texts and tapes are those developed by Fullerton Junior College Math Staff. In addition the lab is available for independent study and tutor help for courses in Trigonometry, Statistics, College Algebra, and Analytical Geometry and Calculus.

The lab for this semester is open for the following hours and days:

Monday	7:00 AM to 5:00 PM
Tuesday & Wednesday	7:00 AM to 7:00 PM
Thursday	7:00 AM to 9:00 PM
Friday	7:00 AM to 4:00 PM

In order to fill the above time schedule, the following personnel are used:

1. Director - Certified teacher (8:00 AM to 3:00 PM) daily
2. Three teachers (3-5 hours)
3. Four tutors
4. Student Assistants - routine tasks, some are also tutors. (2,3 or 4 are used at strategic times during the week)

There is work-study funding available for 8 student helpers, while others are paid through the Math Department Budget.

Although tutors are available, audio tapes are emphasized and used extensively, and some slides are with tapes and are used moderately for introductory material (Arithmetic). The students are permitted to check out tapes for home use as well as make copies of them.

After three years the director feels that the lab system at L.B.C.C. is reasonably successful to justify continuation of the program, but by no means the ultimate answers. "It is simply another avenue for trying to help students learn the fundamentals of math." Many students cannot adapt to self-pacing, (even structured pacing). It is important to attempt to place a student early in a semester in the setting where one is most likely to succeed. Pre-testing is used to overcome faults of counseling staff in student placement. Flexible scheduling and freedom to complete a program early is great for students with self-motivation. Also, many weak, slow, students often succeed. However, unless the teacher is alert and constantly monitoring student progress, the student can easily be lost (withdrawal). In order to encourage perseverence, the director keeps a folder with written weekly checks and comments and continued verbal contact with "follow-up letters", if necessary.

In general, the faculty and administration attitude is one of great appreciation for the services provided for the students. There are those that call the lab "an expensive study hall and that they should not be concerned with motivation".

However, the director is so encouraged that he is writing a paper on the results of the three years of operation, (available in a few weeks). Part of the statistics in this paper, in reference to the Arithmetic Course, indicate that in comparison with the previous lecture method of presentation, the structured self-pacing method shows 14% improvement in grades A, B, C; 56% failure down to 43%; and a 13% increase in number of completions.

Math Lab Survey Report: Santa Barbara City College

The Math Lab at Santa Barbara City College seems to be well established under the directorship of Dr. Robert A. Carman, a Math Instructor. He not only directs the lab but also has written the textbooks used. The texts were thoroughly field tested (1-1/2 years to 3 years) in three Community Colleges, 1 state college, and 1 high school before publication, for reaction by teachers and students and then rewritten before publication.

In the main, the lab is one of the individualized-paced type in which student tutors and instructors are available to aid students. It consists of a regular classroom containing about eight tabels and blackboards. A separate learning center has audio tapes used by a few students. A "drop-in help" lab is offered for all math courses. There are a few individualized lecture-lab combinations for a few sections of Basic Algebra. The lab for the Arithmetic course is open:

9:00 AM to 8:00 PM	Monday through Thursday
9:00 AM to 5:00 PM	Friday

Instructors and/or tutors are available at all times.

At present, the courses offered and texts used are:

Basic Math Skills: J. Carman	Arithmetic (3) units; approximately 1000 enrolled
Basic Algebra: J. Carman	Elementary Algebra (4) units; approximately 250 enrolled

Lecture 3 hours, lab 2 hours

Audio tapes available to supplement both texts.

Plans are being made to add self-instruction courses or individualized modules in trades math, math for nurses and math for science courses.

The personnel for the lab and their functions are:

Instructor:	Certified person who supervises lab, trains and supervises tutors.

Classified Aids:	Supervise tutors and listening to students.
Student tutors:	About 25-30 tutors for 700 students. Available in lab as well as by appointment.

Although the attitude of the Administration is a very positive one, the general attitude of the Math Faculty is one of indifference; "they are too busy, with Calculus students to worry about the Developmental Arithmetic course". However, evaluation shows that the program is working. Research has been done and shows that the lab is doing a satisfactory job of teaching and preparing the students for further course work. The program is relatively inexpensive: the students (one the whole) like it and low drop rates are realized. Statistics for the last semester (ending January 1977) indicate about 62% survival in the Arithmetic Course; 75 to 80% in the Elementary Algebra Course.

Dr. Carman's criteria for a successful lab are as follows:

1. The text must explain matieral clearly and completely to the students, include adequate worked examples and exercises, have proper reading level, and appeal to the students.
2. Required attendance. A few very good students may proceed at own rate and take tests only.
3. Students be assigned to same tutor.
4. Tutors must be familiar with book and its language, and base their explanations on the text.
5. Teacher should maintain close contact with tutors, meeting with them at least weekly. Tutors must be trained as tutors.
6. Students must pass tests or be assigned more tutor and lab time. Tutors are available by appointment.
7. A close personal contact with students should be kept, so that they are encouraged to succeed and to remain enrolled. Students are notified that they will be dropped after missing 2 sessions.

Math Lab Survey Report: Golden West College

The Math lab at Golden West College is in a large, separate complex, offering a variety of resources, both human and mechanical. Although no classes are offered through the lab itself, three courses use the Math Center facilities, on an assigned basis. These courses with corresponding texts are:

Basic Math:	Keedy and Bittinger	Arithmetic
Algebra I:	Moon and Davis	Elementary Algebra
Intermediate Algebra:	Wooton and Droyan	Intermediate Algebra

Also, a nine week course in A.P.L. programming language. (Gilman and Rose: A.P.L.) Students can get 1/2 unit of credit each nine weeks if they sign up of one hour of tutoring and two hours of directed study per week.

A large staff is used to maintain the lab facilities; which, are available from:

8:00 AM to 10:00 PM	Monday through Thursday
8:00 AM to 5:00 PM	Friday

There are three classified staff members, with math background. Two classified persons are on duty eight hours per day while one has one night assignment of five hours, four days per week. Instructors teaching audio-tutorial classes spend two or three hours a week in the lab. Other instructors spend time to meet full load requirements, usually two hours a week. About ten to twelve tutors are available for five to ten hours a week, a total of 100 tutoring hours per week. The classified staff personnel tutor students, maintain equipment; assist in development of course material; develop displays and provide feedback to instructors on student and course problems. The lab center was completed last year, and consists of four rooms with math faculty office adjacent. There is a main room, which has forty study carrels with tape players and slide projectors as well as space containing tables and chairs for about

fifty people where students may study or secure tutoring help. Two large blackboards, three bulletin boards, book and counter space, as well as six hand calculators and one H.P. statistical calculator are available for student use. Another separate room has ten computer terminals for student use connected to the district computer at another location. The other three rooms are video-viewing rooms, three television sets, the storage/work area and a classroom which is used for math seminars and special interested lectures (available for group study in the afternoons). The lab center has a total capacity for about 150 students.

The equipment for this lab has been purchased (at various times) through N.S.F., N.D.B.A., and H.E.W. grants. Funds for student tutors are available from E.O.P. program while funds for student assistants are provided by both College Work Study Program and district funds.

In general, there is an on going program to develop material independent of a specific text. Some faculty members are developing slide-tape presentation packages which are not keyed to a text but will cover specific objectives. Additional computer courses and use of center equipment by more advanced math courses are being considered.

According to one of the Instructional Associates, (classified math person) the faculty and administration are extremely supportive. Also, the district itself is quite financially solvent and is able to support such a large and well equipped lab.

Math Lab Survey Report: Bakersfield College

The lab (about 100' x 100') is located in one corner of a large library. Offices are located in the center. At present, the lab is mainly a self-paced one. There are classes with large numbers of students enrolled in:

Basic Arithmetic	650
Preparatory Algebra	120
Beginning Algebra	130
Intermediate Algebra	100
Trigonometry	30

The lab is available for "drop-in" as well as independent study with tutors.

An audio-tutorial system of instruction is used, patterened after the method used at Fullerton Junior College in which texts are used as visual part synchronized with tapes. (moderately used) Computers are used for grading and recording tests.

A large personnel is necessary to run the lab.

Director: (teacher)	coordinates program (also teaches)
Instructors:	five, part-time
Tutorial supervisor:	
Classified persons:	equipment, testing, file.
Tutors:	($2.50/hr with 15 hours a week maximum)

The director feels that the best tutors are those who have just completed the course. He encourages students to enroll in a special course for tutors (Sociology 5) in order to receive college credit. At present, there are about 25 enrolled in the class. They receive 2 units of credit for 5 hours a week, or one unit of credit for 2 1/2 hours a week. Other tutors are used from advanced math classes and from Cal State.

Plans are being made to hire retired teachers as tutors. The tutors are mainly college supported ($2,000.00) from general budget.

In order to accommodate the classes the lab is open many hours a day:

8:00 AM to 10:00 PM	Monday through Thursday
8:00 AM to 5:00 PM	Friday

During these hours, teachers have schedule time:

8:30 AM to 3:30 PM	Monday and Wednesday
8:30 AM to 12:30 PM	Tuesday and Thursday
6:00 PM to 10:00 PM	Friday

A time clock is used for students and tutors.

Several years ago, the math classes at B.C.C. were the lecture, tapes and quizzes combination system. However, classes became too large and the system was enlarged to include review sections with tapes. Last year, a completely individualized system was adopted with-in "open-entry" and "open-exit" lab with over an enrollment of 1000 students. At the end of last semester 10% complete courses, another 10% is contemplated by Easter, and 20% by the end of the semester, a possible 40% of the original 1000 enrollment! With this in view, the director is contemplating a return to a lecture-lab combination for the Basic Arithmetic classes. He feels that students taking Arithmetic need the daily discipline, another exposure in addition to tapes. Also, he intends to adopt the new edition of Basic Arithmetic (Fullerton). An interesting feature of the B.C.C. lab is one called "Diagnostic Division". One instructor is in charge with 4 tutors as helpers. Its purpose is to furnish help to those who are not ready for the Arithmetic course or are physically and mentally handicapped. The tests in this class are administered in such a way that the student is given one problem (at a time) which is immediately corrected before proceeding with the test. Upon observing this department, I noticed a student writing with a pencil in his mouth.

Math Lab Survey Visitation: Chaffey College

The math lab at Chaffey College is an integral part of the Math Department. It is entitled: Physical Science Multimedia Instruction Center (PhSMIC). A Student Guide to PhSMIC, (7" x 8 1/2", 8 page booklet) is available and includes the following:

1. Showing the location on a campus map.
2. Floor plan of classroom size.
3. Detailed general information on procedure of operation.
4. A description of courses offered, including prerequisites and the minimum requirements for completion of courses.

At the present there are six courses:

All texts are written by Mr. Blanchard, Director of the Math Lab.

1. Review of Arithmetic — 3 - (1) unit courses
2. Elementary Algebra — 5 - (1) unit courses
3. Math for Health Sciences — (1) unit courses
4. Slide Rule — (1) unit
5. Introduction to the Metric System — (1) unit
6. Math for Interior Design — (1) unit

Other courses to be added are:

1. Intermediate Algebra
2. Plane Geometry
3. Math for Fire Science

The Lab is open:

8:00 AM to 3:00 PM	Monday through Friday
5:00 PM to 10:00 PM	Monday through Thursday

Time cards are used for attendance, checking out equipment, and for recording of test and final grades.

The lab is under the direction of a certified teacher, William B. Blanchard, who initiated the center 6 1/2 years ago. He not only writes all texts, but also designed the room arrangement as well as carrels. His work load is 25-30 hours per week, with 5 hours per week at night (overload pay). The district is planning to hire certified help for night. There is para-professional help, each hour the labe is open, who are responsible for all records, maintaining supplies, supervising student help, grading tests, all functions of the lab. Student help is used about 50 hours per week to answer student questions, grade tests, under supervision, clerical work, and maintain equipment and carrels. Students are not permitted to help on lessons unless they have taken lessons themselves.

Mr. Blanchard indicates that the advantages to the lab are as follows:

1. Students with rotating or odd schedules do not have to drop (flexibility)
2. Students may progress at their own pace.
3. Students may not progress until they meet minimum levels of achievement.
4. Students may get help immediately with any problems on lesson material.
5. Students may add classes at any time as long as the instructor feels it is to their educative advantage.

Special funding for this lab includes two H.E.A. grants in 1971 and 1972 for equipment and carrels as well as one from E.E.A. in 1971 for one para-professional aid.

The administration of Chaffey College has been solidly behind the lab. However, math faculty attitude runs from lukewarm to fully supportive. At least one of the math instructors sends many of his students who cannot handle the pace of the 5 unit Algebra class, to the lab where they can go at a slower pace and earn 1 or 2 units of algebra in the lab before the end of the quarter.

Math Lab Survey Report: College of the Canyons

Although College of the Canyons is a comparatively new college, they are developing and using a math lab to aid students. It consists of a regular-sized classroom with large chalkboards along two walls, and a third wall containing portable polar and coordinate axis chalkboards. There is a math reference library, copies of all math texts in use, with teacher manuals, two desk-sized computers, one with plotter, many math models and paraphrenalia, math bulletin boards, and old test files. The room is furnished with tables, some trapezoidal to accommodate rearrangement when desired, and others large and rectangular with space for spread-out books. The large tables have 12 Hewlett-Packard HP-45A calculators attached to them.

A full time classified person (Math Lab Specialist) with math background at least through Calculus is in charge of the math lab and its operation. This person sets up lab schedules, trains and supervises student tutors, sets up their schedules, handles independent study students, administers tests give in the lab, and acts as head tutor. A half-time classified person with similiar qualifications supervises the lab at night and acts as head tutor then, is also under the direction of the full-timer.

The lab hours are:

9:00 AM to 9:00 PM	Monday through Thursday
9:00 AM to 4:00 PM	Friday

The personnel are:

1. Math Lab Specialist in the lab all hours of the day
2. Instructional Aid, Mathematics in lab all hours night
3. Two to three student tutors in lab all hours

Tutors are all capable of tutoring students from all classes - Arithmetic through Calculus - and are scheduled for 12 to 15 hours per week, in the supervised lab. They receive no training, other than supervisory, and with this many tutorial

hours rapidly become proficient. Tutors are chosen not only for their strong mathematics background, but also for necessary tutorial qualities such as patience, enthusiasm for mathematics, sensitivity, and ability to identify with students of all abilities, math levels and ages.

The first week of each quarter the Math Lab Specialist and tutors visit each classroom to explain the philosophy, operation, and schedule of the Math Lab to the students, and to encourage its use. This visit enables each student to also beome familiar with the personnel of the lab.

The tutors are funded through the regular district budget, occasional college work study funds when qualified students are available, and an E.O.P.S. tutorial allotment. The total student tutorial budge has been under $7,000.

Some studnets, with teacher permission, have taken math classes on an independent study basis, and these students are handled by the Math Lab Specialist and staff. Independent study students have usually proved to be those students who are taking the class for review, or those who can work at a pace more acclerated than the class. Other students are encouraged to attend regular class sessions. Courses available for independent study have been: Arithmetic, Elementary Algebra and Intermediate Algebra. A few exceptional students have been allowed to independently study Trigonometry and College Algebra.

Texts used have been:

Arithmetic: Bloomfield, From Arithmetic through Algebra

Elementary Algebra: Nanny and Cable, Developing Skills in Algebra 1 and II

Intermediate Algebra: Newmeyer and Klentos, Intermediate Algebra

The fundamental philosophy of the College of the Canyons Math Department and Math Lab staff is to provide learning assistance to all students regardless of level of achievement or ability. The Math lab exists to further this goal by offering tutorial services to all students who want help in basic Arithmetic through Calculus. The Math Lab is not only a Basic Skills Lab, in fact, our records show than an average of about 60% of the students come from baccalaureate

certified courses.

The math department recognized that success in mathematics is related to self-image. An important goal of the math lab is to create a successful attitude among our students by improving their self-image. We feel this can be accomplished by encouraging an active involvement by the student. Passive listening is not condoned, nor a quiet atmosphere desired. Since we feel there is no substitute for person to person immediate tutoring, we foster a human approach in our lab. It is not our goal to become excessively mechanized. Group studying is also encouraged because the sharing of ideas inspires personal growth. It is felt that this human approach, with drop-in tutoring, will enable any student. who desires it to keep up with the instructor's normal collegiate class pace.

During winter quarter, 1977 when about 500 students were enrolled in math classes during the first census week, 2400 student sign-ins were recorded in the math lab. Statistics have shown that about sixty percent of the math students enrolled census week make use of the lab, and their average length of stay is estimated to be about an hour and a half.

Because instructors have been involved in determining the function and operation of the Math Lab, and have constant input into its activities they have a very supportive attitude toward the lab and its personnel.

The district administration has been slow to recognize the Math Lab as a valid entity, but has recently formed a committee with administrators, counselors, instructors, and math lab staff to investigate the expansion of the lab and its services. We feel this is a positive step.

Math Lab Survey Report: Mount San Antonio College

A somewhat elaborate lab exists at Mount San Antonio College. Funds for equipment as well as tutors come from the college budget. It is under the direction of the Math Lab Director (forty hours a week) who is also a certified teacher. He maintains equipment, gives and grades tests, and supervises tutors.

The primary function of the college supported tutors is to give reasonably brief help in all areas of Math. The tutors are generally recruited from the Calculus classes and they work between five to fifteen hours a week, at present, there are eleven tutors (usually there are only five to seven tutors).

The lab is open from :

8:00 AM to 10:00 PM	MOnday through Thursday
8:00 AM to 5:00 PM	Friday

Tutors are available from 8:00 to 4:00 PM everyday, but most are gone by 1:00 PM.

There are about $45,000 to $60,000 worth of equipment located in a classroom size room plus two smaller adajacent rooms. The main room can handle about 30 students and contains audio-visual equipment for twelve. One of the smaller rooms has T.V. equipment used for hearing and viewing special Math lectures (used by some of the faculty members). The other room has equipment for making audio-visual tapes.

This lab is classified as a "lecture-lab", one as well as a "drop-in" help type. The courses offered are the Arithmetic and Elementary Algebra and the texts used are:

Wright: Arithmetic for College Students

Keedy and Bittinger: Introduction to Algebra

Johnston and Willis: Essentials of Algebra

According to the director, the major advantage is that students can get help, from either a tutor or himself, in any community college math course, at any time during the scheduled hours. The fact that for some courses the students can both hear and see the instructor is very advantageous. Also, he feels that there are not enough topics on tapes and the space is too small for the four houndred to four hundred and fifty students using the lab per semester.

Both the math faculty and the administration are favorably inclined toward the lab. A favorable student attitude is indicated by the fact that almost as many students not assigned to the lab make use of it as those who are assigned. In light of this, and because the district is financially able, the lab should continue to grow and expand its facilities.

Math lab Survey Results: Fullerton College

One of the earliest and outstanding Math Lab methods was developed, tested and used at Fullerton Junior College, in 1969. A teacher was allowed a paid summer session to work on an alternate method of teaching math, than the lecture one. He developed a so called, "Audio-Tutorial" approach. A text was designed in Intermediate Algebra to correlate with audio-tapes, permitting students to read through a math unit and at the same time listen to an explanation of the problems and theory. The method was an attempt to remedy the defects of the traditional lecture=textbook method by putting the lecture and other explanations on audio tapes; chalkboard explanations were put in a text. Thus, each student has a permanent record of material presented in class and may go through lecture at his own rate; he may review as often as desired by reversing the recorder and turning back a few pages on the text.

The Math Department supervises an "Audio-tutorial Center" with one hundred study carrels. Each carrel contains a tape recorder and a work space. Also, the library contains 40 carrels available for student use. The center is open:

7:00 AM to 10:00 PM	Monday through Thursday
7:00 AM to 3:15 PM	Friday
9:00 AM to 3:00 PM	Saturday

There are two classified lab attendants in the lab Monday through Friday. Teachers offices are located adjacent to the labs; hence, teachers are available for students who need individual help. One instructor and one lab attendant are in the lab during Saturday session.

At present, there are five courses offered. The texts were written by the various members of the faculty. The courses offered are:

Basic Arithmetic

Elementary Algebra
Intermediate Algebra

Elementary Function

Trigonometry

Geometry

Principles of Math

Plans are being made to add a course in the use of calculators.

Since written time schedules are made indicating number of units to be covered each week, and since classes are held for explanation and question only, two or three times a week, this lab is classified primarily as a paced-individualized method of instruction. The main emphasis is on the tapes, which are used extensively and lab attendance is required. Students are allowed to check-out tapes from the library for home use. Quizzes one each unit are given on each unit usually in the classroom; tests, over several units are taken in the lab at the time of student convenience. Hence, students must persevere in order to finish by the end of the semester.

There are 42 sections offered, evening included, approximately 1500 students a semester. One instructor of an Intermediate Algebra course indicated, that out of a class of about 48, 23 completed courses, a 50% survival.

The Fullerton texts have been and are still widely used. The approach used iw quite a "Modern" one, requiring understanding of general principles, an axiomatic approach, with emphasis on "set notation". This approach is great for students who intend to continue math study. Hence other texts have been are are being published with more emphasis on student mastering of math skills.

Math Lab Survey: San Diego State University

In order to deal with the increasing number of students with varied and poor math backgrounds, an attempt has been made at San Diego State University referred to as a Modular System of Instruction called M.S.I. The only course offered under this system is Intermediate Algebra for three units. The course was designed in such a way that each student could learn those course objectives which best suit one's educational goals as quickly as one is able.

The text used for the course is Intermediate Algebra by Keedy and Bittinger. There are 18 parts into which the course is divided (modules) and the student is required to demonstrate mastery on each module before starting work on the next one. Study guides for each module are given to each student upon completion of a previous module.

Under this self-pacing system, each student is assigned or chooses a proctor at the beginning of the course but a student may have his test graded by any available assistant or the instructor himself. The proctors are usually undergraduate students who grade tests and coach and tutor their peers. Each student is expected to come to class at least onece a week. If not, the proctor is supposed to call to find out what the difficulty may be. Thus, although the student is allwed to pace himself, one is not allowed to continuously procrastinate.

As for the physical conditions, two separate classrooms are being used, one for tutoring and the other for testing. The "Testing Center" is a fairly large classroom divided into two parts. One part contains chairs in which the students take tests. One proctor issues tests as the students enter while another proctor monitors the tests. Behind the chairs are two banks of partitioned offices, about 12 of them, separated by a hallway. These offices have desks along one wall with room for three or four persons and blackboards along the other walls. As a student completes a test, he proceeds to an office in which his

test is corrected and his erros are explained. According to the director, 600 students are processed in 6 hours. A student may seek tutoring or take a test during the hours of 8:00 AM to 2:00 PM on Monday, Wednesday and Friday.

Special funding for their equipment was made through the "California State University and College Fund for Innovation". A computer stored test bank is used to generate 90-100 tests each semester. The computer contains test questions for Intermediate Algebra, College Algebra and Trigonometry. Teachers from other institutions may obtain computer generated tests.

Since a great deal of the success of a Math Lab is dependent on the proctors, the lab director has prepared a "Proctor Training Manual". See the following enclosures. This manual is quite detailed, and is divided into six parts corresponding to the six types of skills needed by a proctor:

1. The Course Procedures
2. Proctor Procedures
3. How to Proctor a Test
4. Establishing Rapport with Students
5. The Art of Tutoring
6. Demonstration of mastery of the math in the courses one will be proctoring

Tests are given for each of the above mentioned parts.

More explanation of the lab at San Diego State University are included in other following enclosures.

Math Lab Survey: University of Arizona

In 1972, an attempt was made at the University of Arizona to get away from the traditional lecture method of teaching the Algebra Courses in sections of 200 or more. One of the faculty decided to experiment with a different approach. His method evolved into the Individualized Learning System (I.L.S.) This system is now used with about 3,000 students a semester and includes courses in:

Introductory Algebra

Intermediate Algebra

College Algebra

By experimentation for over a period of five years, the director found that for most students class time was best used in taking and reviewing quizzes, attending help sessions, or working exercises. Hence, all lectures were discontinued. However, a series of 72 or more color video-taped modules were made to replace the lectures. Each tape runs about 15 minutes. Tapes do have a great advantage in that students can see and hear presentations of the topic they are studying at any time during the semester. Also, at a given time students may be studying Unit Ten while others are still working on previous units. There is an emphasis on application of math.

Students taking any of the Algebra Courses may earn one, two or three units per semester depending upon how much of the material they can master. During the first class meeting a placement exam is given, and the students enrolled in the particular Algebra for which they are eligible. A student may complete a course within the semester time and may immediately begin work in the succeeding course if time permits.

The material in each course is divided into 12 units, each of which requires approximately one week's study. Quizzes are given at the end of each unit.

If a student fails a quiz, less than 20 out of 30 points, he will need to restudy the unit and take other forms of the quiz until a passing score is obtained.

In order to complete a three unit course in a semester, a "Schedule of Completion Dates" is printed in a description folder, see enclosure, for the I.L.S. System. If one fails the first attempt at a quiz, or is unable to take a quiz on a scheduled date, a student may use the two quiz days following the normal date as make-up days. Students who find they cannot maintain the scheduled pace are advised to change enrollment from three parts of the course to two parts. If more time is needed, a student changes enrollment from two parts to one part.

A large theater type classroom is used as a testing center. Students fill out a test request from indicating particular test to be taken. Then they secure test from a large table showing the University of Arizona identification with a picture. There are three people in testing center at all times, including an instructor. Students are directed where to sit and are put under surveillance during testing period. Color coding is used to indicate the form of the Test, A,B,C,D, being used in a particular course. One hundred-sixty tests are taken an hour on a busy day. The tests are twenty minutes long; a student may take more than one test during the test period. Each test must be punched "IN" and "OUT" by a time clock. If the elapsed time is more than 25 minutes, the student receives a zero score for that quiz. Record of quizzes are kept by a computer. Each student has a number. Grades on quizzes are posted by number in testing center and the two math rooms. A lab of this size requires a large personnel. There is a director, Dr. Thompson, who oversees the system, writes the math units and makes the audio tapes. He has two Math Instructors with masters degrees as assistants. About five or six graduate students, a technician, plus a large classified staff are used to carry on the necessary work.

Students taking courses by the I.L.S. System are expected to study material on their own and then attend discussion sessions where an instructor will answer questions. A printed detailed "Discussion Session Schedule" is available. The

schedule indicates that a great number of discussion sessions are held for most hours of the day between 8:00 AM and 3:00 PM, Monday through Friday. Students may attend and leave when they like.

According to the director, the system of mandatory placement tests combined with flexible-paced enrollment has increased the survival rate up to an acceptable level. In 1975, statistics for a typical section of Intermediate Algebra indicates that the 225 students who enrolled 36% were moved to Introductory Algebra. Of those who moved to the Introductory Algebra and actually started work on that course, 67% passed. Six of these students went on and passed some part of the Intermediate Algebra and actually started work on that course, 79% passed in one or more parts, receiving one to three units of credit. Of this group, 68% passed two of the three parts, and 17% passed only one of the three parts. It was also indicated that 30% of the students that registered in the course never appeared to begin work in a class.

In addition, the director is convinced that the I.L.S. System does a better job than the lecture method. The success seems to come from these basic factors.

1. Students are placed in a course at a level where they have a reasonable chance to learn material.
2. Students are shown exactly what they must learn and are aided in their learning by readable texts and persnal assistance in discussion sessions.
3. Fixed standards are given for the level of work that is expected and students do no progress until they have learned a given part of material well enough to meet those standards.

Math Lab Report: University of California, San Diego

A somewhat unique lab is the one at U.C.S.D. It is primarily a large tutoring service which provides 50 to 100 tutors per quarter. All prospective tutors are required to take special training. They must enroll in a 4 unit training course entitled "The Psychology of Teaching and the Structures of Information for Academic Learning." The program is under the direction of the "Tutorial Coordinator" who, at the present time is a psychology major with a master's degree and course work completed for Ph.D.

Under this system, there are three ways to tutor:

1. Attend math class for which they are assigned three students for tutoring.
2. Work in a large math and physics clinic, six hours a week. The clinic is an open lab and tutors are available to help students on a walk-in basis. Over 600 math students use this service.
3. Tutor several students at one time. Exceptional tutors are assigned six to eight students and meet with them two times a week. They meet in separate rooms containing blackboards and reference library.

Potential tutors must be an upper division student of Junior standing, have over a 3.0 average, and have attended U.C.S.D. for two quarters. The tutors are periodically evaluated by the students as well as the director.

A great deal of continued evaluation is made of this program. Tutors are required to attend at least one interview with the Tutorial Coordinator, meet with their tutees at least once a week, and attend the course in which they are tutoring.

All clinic tutees fill out a card at the beginning of the quarter for statistical purpose only and are not retained as part of anyone's personal record. The card includes general information; name, address, phone, college major, etc., as well as ethnic identity. A record of tutoring service is recorded on the back indicating date, course, concepts presented.

During the quarter, special review seesions are advertised and promoted on the most needed concepts. Later, students are given a tutor evaluation questionaire from which information is gathered for the purpose of creating a more effective program; selecting and utilizing tutors efficiently.

Funds for this tutorial program are from five different sources. Three of the sources are; Ethnic Opportunity Fund, registration fees, and University budget.

Two evaluations of the program are available in this report under separate cover. One is the result of students evaluation of instructors and the courses, and the other is the results of the evaluation of the tutorial program. (1976)

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